

Remarks

Claims 1-12 and 23-26 have been amended. Claims 13-22 were previously canceled. New claim 29 has been added to clarify that the images may be detected by a single sensor or two separate sensors. Claims 1-12 and 23-29 remain pending in the application.

Allowable Subject Matter

The Applicant thanks the Examiner for identifying dependent claims 2, 3, 5, 7-11, 24 and 25 as being allowable if rewritten into independent form. Applicant has amended independent claims 1 and 23 to overcome various rejections set forth by the Examiner and believes that these independent claims are also allowable over the cited references for the reasons described below.

Amendments to Specification

The application has been amended to correct a minor typographical error identified by the Examiner. Applicant submits that the amendment to paragraph [0004] of the specification contains no new matter. The Applicant respectfully requests that the objection to the specification be withdrawn based on this amendment.

35 U.S.C. §112

The Examiner rejected claims 1-12 under 35 U.S.C. 112, second paragraph as failing to particularly point out and distinctly claim the subject matter which the applicant regards as his invention. In addition, the Examiner objected to claims 1, 2, 4, 6, 7, 9-11, and 23 for having several informalities. These claims have been amended. Applicant respectfully submits that the objections to the claims and rejections under the second paragraph of 35 U.S.C. 112 are no longer relevant to the presently pending patent application and requests that they be withdrawn.

35 U.S.C. §103

Claims 1, 4, 6, 12, 23, 26-28 were rejected under 35 USC 103(a) as being unpatentable over US Pat No. 6,341,035 to Miura et al. (Miura '035) in view of Japanese Pat No. 09-309402 to Katou et al. (Katou). Applicant respectfully suggests that Miura '035 and

Katou, when considered individually or together in combination, fail to suggest or teach all of the elements of the presently pending claims as amended.

The present invention as claimed includes an illumination, be it a single beam or a plurality of beams, that is focused into a focal plane of the sample, ideally as a diffraction limited point. By scanning the point(s) a 2-dimensional image is formed from the intensities encountered during the scan. The light that returns from each focused point in the sample focal plane is imaged into an equivalent focal plane at a detector (imaging system).

In practice there will also be light reflected, refracted, diffused, etc., from the illuminated point within the sample and from the traversal through the sample depth of the illuminating beam (both before and after the plane of focus of the points) within the sample. Some of this light from layers of the sample above and below the focal plane will also reach the image focal plane. This light will not be in focus in said image focal plane, but will appear as a diffuse disc. The disc size will increase and the intensity decrease as this light originates from distances further from the point plane of focus.

By creating an intermediate image focal plane, and positioning a suitable mask in this plane, the mask can be arranged to only pass the return light that arrives at the image focal plane at the same spatial position as the focused points of illumination in the sample, thus forming a confocal image.

However, the light that does pass through the mask will include a percentage of the 'unwanted' light from planes outside the plane of focus in the sample. This percentage will decrease with distance of the source of the light away from the focus plane of the sample. This unwanted light is present in virtually all conventional confocal imaging systems and causes a reduction in contrast of the confocal image (increased 'haze') and increases the width of the confocal 'slice'.

By keeping the illumination constant, but changing the mask so that the return light from the illuminated focused points in the sample, (and hence at the intermediate image focal plane), are blocked at the intermediate focal plane, creates a second image that is formed from the 'unwanted' or non confocal light. Subtracting the second image (formed from the unwanted, non confocal light) from the first image (confocal plus 'haze'

light), and with suitable weighting applied to the first images and to the second images, results in confocal images with increased contrast and a narrower ‘slice’ thickness than can be achieved in conventional confocal systems.

In contrast, Miura ‘035 does not generate a confocal image until after the processing step. Miura is capturing a wide field image and a composite image, using widefield illumination and random pinhole or slit illumination respectively, and subtracting the widefield image from the composite image (confocal plus wide field) to leave a confocal image.

However, as presently claimed a confocal image is captured using point illumination and a point type mask in the imaging pathway, and an image representative of the scattered light from around the illumination points using the same point illumination but with an annular pinhole mask in the imaging pathway. Subtraction does not provide a confocal image as in Miura ‘035, but improves the contrast and confocality (depth resolution) of the confocal image already captured.

Katou adds little, if anything to the teachings of Miura ‘035, because Katou does not form an image with his scanning systems. Katou appears to be determining the presence or absence of a crew member (or portion of a crew members anatomy) at a limited number of scan positions relative to the seat. In addition, the illumination beams are not focused into the sample (space immediately in front of the seat) which is a requirement of confocal imaging systems. Thus, Katou appears to be from an entirely different technical field and even if combined with the teachings found in Miura ‘035 would not actually teach the device or method presently claimed.

In particular, neither Miura ‘035 nor Katou teach or suggest capturing an image as well as an image representative of the scattered light (or band) from around the illumination point using the same point illumination as claimed in independent claims 1 and 23. This image representative of the scattered light (or band) is then subtracted from the confocal image as claimed in independent claims 1 and 23.

Claims 2-12 and 27 depend from claim 1 and therefore are allowable over Miura ‘035 and Katou for the same reasons that claim 1 is allowable. Claims 24-26 and 28 depend

from claim 23 and therefore are allowable over Miura '035 and Katou for the same reasons that claim 23 is allowable.

Therefore, under 35 U.S.C. 103(a), Miura '035 and Katou both fail to teach the present invention as claimed in claims 1-12 and 23-28 and withdrawal of this rejection is respectfully requested.

The Applicant has reviewed the other references cited by Examiner and determined that they do not teach or suggest the present invention.

Conclusion

On the basis of the foregoing, Applicant respectfully submits that claims 1-12 and 23-29 are now believed to be in condition for allowance. Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Respectfully submitted,

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